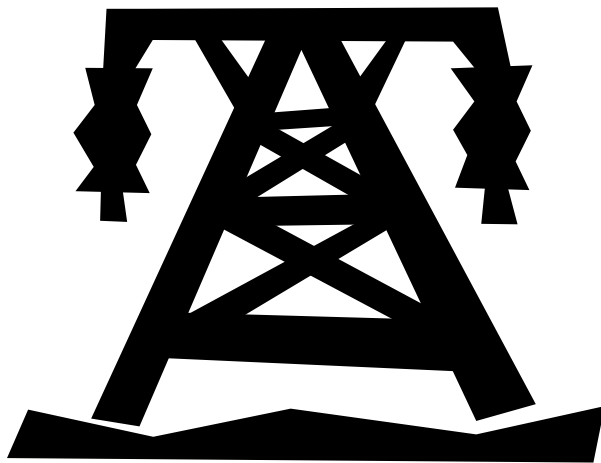


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# Watts It To You?

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## **Project Description**

Students assume the role of an energy stakeholder and work together to develop a county energy plan to increase the amount of electricity produced locally.

## **Grade Level 9-12**

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# Teacher Guide

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## Background

*Watts It To You* is a role play that was designed to engage students in a debate over the advantages and disadvantages of the various energy sources. In this activity, secondary students assume the role of an energy stakeholder and work together to determine how their county will increase the amount of locally produced electricity. Students will learn to evaluate the economic, environmental, and social trade-offs associated with the major energy sources used to produce electricity.

## Concepts

- All energy sources have economic, environmental, and social advantages and disadvantages.
- All of those advantages and disadvantages are considered when determining which energy sources to use in real life.
- Individual and social needs and very important considerations in determining which energy sources are used in real life.

## Time Required

Three to five class periods

## Skill Reinforcement

- Negotiation and persuasion
- Critical thinking
- Math-number manipulation
- Compromise
- Research
- Cooperative learning
- Comparison and contrast

## Materials and Preparation

- Familiarize yourself with the Teacher and Student Guides, and each role play.
- Make a copy of the Student Guide for each student, and enough copies of all four role plays for the whole class to have one (equal amounts of each).

Optional:

- Familiarize yourself with NEED's secondary energy and electricity Infobooks.  
[http://www.need.org/needpdf/infobook\\_activities/SecInfo/IntroS.pdf](http://www.need.org/needpdf/infobook_activities/SecInfo/IntroS.pdf)  
[http://www.need.org/needpdf/infobook\\_activities/SecIntro/Elec1S.pdf](http://www.need.org/needpdf/infobook_activities/SecIntro/Elec1S.pdf)
- Make NEED's Secondary Infobooks available to students (See enclosed information).

- Do some background research to familiarize yourself with the subject (See the information provided).

Enclosed Information:

- Need Infobooks on energy, electricity, climate change, conservation, efficiency, geothermal, hydroelectric, lighting, natural gas, solar, biomass and wind. Use this information to help the students if they get stuck and need some pointers.

### **Procedure**

This activity can be performed in small groups of four students (one student for each role) or each role can be shared by two students if there is an uneven number or to reduce the difficulty level.

### **Day One: Energy Introduction**

As a class, discuss energy use, electricity production and the environmental and economic impacts associated with each energy source. Additional topics include efficiency, conservation, environmental justice, global warming and climate change, and renewable energy.

### **Background Options:**

In order to tailor this activity for your class, the introduction can focus on specific aspects of the energy field. For example, a physics class could emphasize the physics of electricity, a chemistry class could focus on combustion chemistry or atmospheric pollution, or a civics/political science class could focus on environmental justice, or how public policy is made.

### **Homework for Students:**

- Read the Student Guide
- Read NEED secondary Infobooks on energy and electricity
- Fill in the Pros and Cons for the Project Descriptions (Homework 1)

## **Day Two: Role Play Preparation**

Go over Homework 1. Answers are on page 7. Make sure that each student has a completed Homework 1.

Break the class into 4 groups and assign each group a role. Hand out the role plays and let each group go over the role. Assist them as needed. If time allows, provide access to the library or internet so that the students can begin their research.

### **Homework:**

- Re-read your role description and research the energy sources that their role promotes and the ones they are against.
- Fill out the Pre-Negotiation Guide with the information that they learn from their research, making sure to note specific examples for the energy sources that they want and do not want.

Note: You may want to allow students with the same role to research and prepare together.

## **Day 3: Role Play**

Split the students into groups so that each group has at least one representative for each role. Begin the negotiation by reintroducing the activity, stating the objective and outcome, and reminding them that they need to act in accordance with their role. Encourage students to review their roles before beginning. At the end of the activity, one student from each group will share a summary of their negotiated outcome with the rest of the class.

Teacher Instructions: The teacher should circulate around the room and facilitate discussion where needed. Refer to the Infobooks to help individual roles get some inspiration or to answer questions that may come up. You may share any outside information you like, just don't share the insider information included in each role with other roles. Feel free to facilitate the negotiation process as needed. Remember that only a majority of the players need to agree on a project for it to be part of the negotiated agreement.

### **Objective (to be read aloud):**

You will assume an assigned role and use the information given to you to help the county achieve its goal of becoming **50% energy self-sufficient**. You must work within the constraints of your role description and along with the other participants to determine how to best produce **350 million kilowatt hours of electricity** for the county locally, either through electricity generation or conservation using the tool

box given to you within the given budget. You should consider costs and who bears the costs of each energy project as well as the technical potential and political feasibility of the various options, environmental impacts, and the reliability of the energy source when coming to an agreement. A project can be selected only if the majority of participants agree to use it.

**Outcome (to be read aloud):**

The outcome of the negotiation should be a completed Golden County Sustainable Energy Agreement with each group members' signature. Although simple majority is needed for a project to be selected, everyone must be satisfied with the final agreement and feel that it meets their needs.

Note: If the negotiation isn't finished in one day, you can use another class period to do so.

**Day 4: Post Negotiation**

As a class go over each group's Energy Agreement and compare the different outcomes. Have each government representative present their outcome to the class. And as a class discuss the outcome.

Note: In order to show the students that this activity mimics real life you may want to find a copy of your local energy supplier's energy mix to show the students where their electricity comes from. You should find one in your electricity bill or on your provider's website.

**Discussion Questions:**

- What did you learn from the activity?
- Do you think this situation would happen in real life? How do you think real life decisions get made?
- What was your strategy? Did it work? Why or why not?
- If you had to do it all over, what would you do differently?
- Do you think it is important for the public to know where their electricity comes from? Why?
- What do you think your county should use for its energy sources? Why?
- What can you/we do to reduce the environmental impacts from our energy use?

## Tool Descriptions

Tool	Description	Pros	Cons
Conservation	Wasting less electricity	No environmental problems Inexpensive	Saves a small amount of electricity Relies on public participation Requires lifestyle changes
Household Efficiency	Using less electricity to do the same things	Very few environmental problems No lifestyle changes	Costs to public for switching appliances Requires production of new products and materials
Geothermal	Using hot and steamy groundwater to produce electricity	Renewable Few air emissions Can operate 24 hours a day	Can only be used where the resource is available Hydrogen sulfide emissions Resources often in sensitive nature areas
Hydroelectric Dams	Converting kinetic energy in falling water into electricity	Renewable No air emissions Inexpensive	Habitat destruction Blocks river for fish and others
Landfill Gas	Using gas emissions from landfills to produce electricity	Can operate 24 hours a day Inexpensive	Gas production decreases over time. Produces lots of air emissions including some toxics
Natural Gas Power Plant Modernization	Making the existing power plant more efficient	Reduces amount of emissions per unit of electricity and total emissions Increases electrical production from the same amount of fuel	Expensive Still produces NO <sub>x</sub> , CO <sub>2</sub> and other air emissions Environmental costs associated with construction
Natural Gas Production	Increase local natural gas production and power plant output	Will increase electricity reliability	Expensive Will increase air emissions
Solar Photovoltaic	Creating electricity from sunlight using solar panels	Inexhaustible No emissions Low maintenance Increases electrical reliability for owners	Very expensive Only work during daylight Work best in very sunny locations
Wind	Using wind turbines to produce electricity	Inexhaustible No emissions Predictable electricity	Can kill birds Work only when windy Only profitable in very windy locations Visual impacts Requires lots of land

## **National Science Education Content Standards Addressed:**

**INT-B:3.a** Energy is a property of many substances and is associated with hearing, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical.

**INT-B:3.b** Energy is transferred in many ways.

**INT-E:2.c** Technological solutions are temporary and have side effects. Technologies have costs, carry risk, and have benefits.

**INT-E:2.f** Perfectly designed solutions do not exist. All technological solutions have trade-offs, such as safety, cost, efficiency, and appearance. Risk is part of living in a highly technological world. Reducing risk often results in new technology.

**INT-F:3.b** Human activities can induce hazards through resource acquisition, urban growth, land use decisions, and waste disposal.

**INT-F:4.c** Students can use a systematic approach to thinking critically about risks and benefits.

**INT-F:4.d** Important personal and social decisions are made based on perceptions of benefits and risks.

**SEC-F:3.a** Human populations use resources in the environment to maintain and improve their existence.

**SEC-F:3.b** The earth does not have infinite resources; increasing human consumption places severe stress on the natural processes that renew some resources, and depletes those resources that cannot be renewed.

**PRI-F:4.c** Pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.